



Operations Monitoring Report

Third Quarter FY19

Prepared by:

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I. Executive Summary

A review of the fiscal year 2019 (FY19) Third Quarter performance and contract obligations between Constellation New Energy (CNE) and the Metropolitan Government of Nashville and Davidson County (Metro) is presented in this report by Thermal Engineering Group, Inc. (TEG). The status of the available funds for all active capital construction and repair and improvement projects are also presented. For the fiscal year 2019 to date, CNE has satisfactorily met all of the contract obligations to Metro and has had no contract violations.

As a response to the solicitation of bids for the Implementation Scenarios for Metro's DES Program Options (RFQ#1044673), Metro issued their intention to award Engie Development, LLC on March 22, 2019. The proposal from bidder included the purchase of the Metro DES for \$60,000,000. The award is contingent upon successful contract negotiations.

For the Third Quarter FY19, the chilled water sales increased 3.6% over the previous Third Quarter (FY18). The chilled water sendout also increased 3.8% over the previous Third Quarter. The system losses increased approximately 8.6%. The peak chilled water demand for the current quarter was 11,746 tons, which is 7.5% higher than the previous Third Quarter.

Steam sendout for the current quarter increased by approximately 3.3% over the previous Third Quarter with a 3.4% decrease in heating degree days. Likewise, steam sales also increased by approximately 3.6% over the previous Third Quarter. Total steam system losses increased by 5.7% over the previous Third Quarter. The peak steam demand for the current quarter was 142,594 pounds per hour, which represents a decrease in the Third Quarter demand by approximately 5.3%.

The EGF performance continues to satisfactorily meet the System Performance Guarantee (Guaranteed Maximum Quantity or GMQ) levels. The chilled water plant electric consumption per unit of sales continues to perform lower than the guaranteed levels for the quarter. Total chiller plant electric usage increased 5.7% from the previous Third Quarter and the unit electric consumption was 2.0% higher than in the previous Third Quarter. The steam plant electric consumption per unit of sales increased over the previous Third Quarter by 4.4%. The total water consumption for the steam and chilled water plants decreased 5.6% from the previous Third Quarter. The steam plant water usage increased by 18.4% for the quarter.

Work continued on DES Capital and Repair & Improvement Projects during the Third Quarter of FY19. Repair and Improvements to the EDS continue as scheduled. DES133.1, DES135, DES139, DES162 and DES163 are ongoing. Construction was completed in the Third Quarter FY19 on DES15, DES158, DES160, DES164, DES165 and DES166. Design completion and bidding are anticipated for DES153, DES157 and DES159 during the Fourth Quarter FY19. Construction is anticipated to begin on DES161 during the Fourth Quarter FY19.

DES144 and DES149 were closed during the Third Quarter FY19. DES160, DES164, DES165 and DES166 are anticipated to be closed during the Fourth Quarter FY19.

The current fiscal year system operating costs to date are \$15,450,833. This value represents approximately 74% of the total budgeted operating cost for FY19. The customer revenues from the sales of steam and chilled water for FY19 (to date) are \$13,689,119 which is approximately 72% of the budgeted amount. The difference between the operating costs and customer revenue is the Metro funding amount (MFA), which represents the shortfall in cash flow for the system. The MFA transferred to date for FY19 is \$1,640,300 (100% of budget) and includes the Fourth Quarter transfer amount. However, the actual MFA required cannot be accurately calculated due to outstanding invoices as of the date of this report.

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II. Energy Distribution Sales and Performance

A. Chilled Water

This section of the report discusses and presents performance information regarding the operation of the EGF for the periods described. Charts and tabular data are also presented to provide a more detailed description of the actual EGF performance.

1. Sales and Sendout

A comparison for the Third Quarter chilled water sales is shown in Figure 1. This data reflects a 3.6% increase in sales for the current quarter over the same quarter of the previous fiscal year.

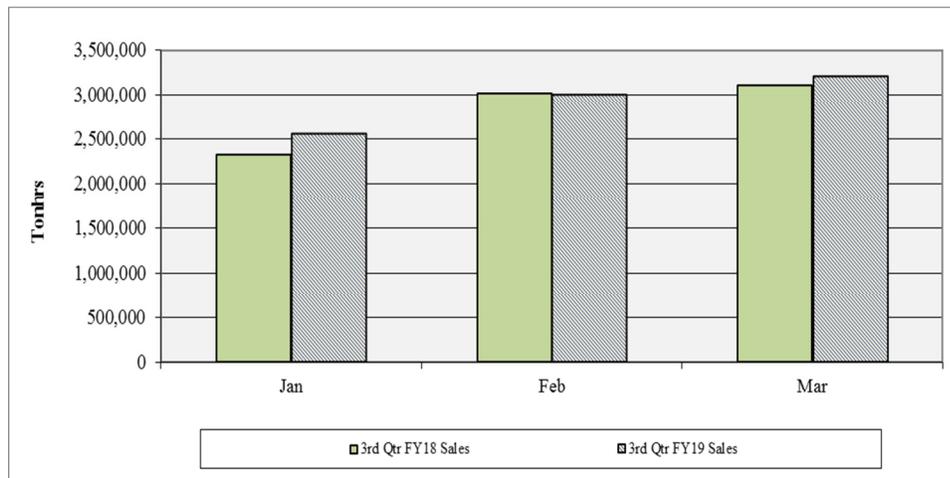


Figure 1. Chilled Water Sales Comparison

The peak chilled water demand for the current quarter was 11,746 tons, which represents a 7.5% increase over the previous Third Quarter.

Figure 2 shows the chilled water sales, sendout and losses for the previous twelve months. The losses on this figure are defined as the difference in tonhrs per month between the recorded sendout and sales values and represent the total energy loss for chilled water in the EDS. The number of cooling degree days per month are also tracked for comparison.

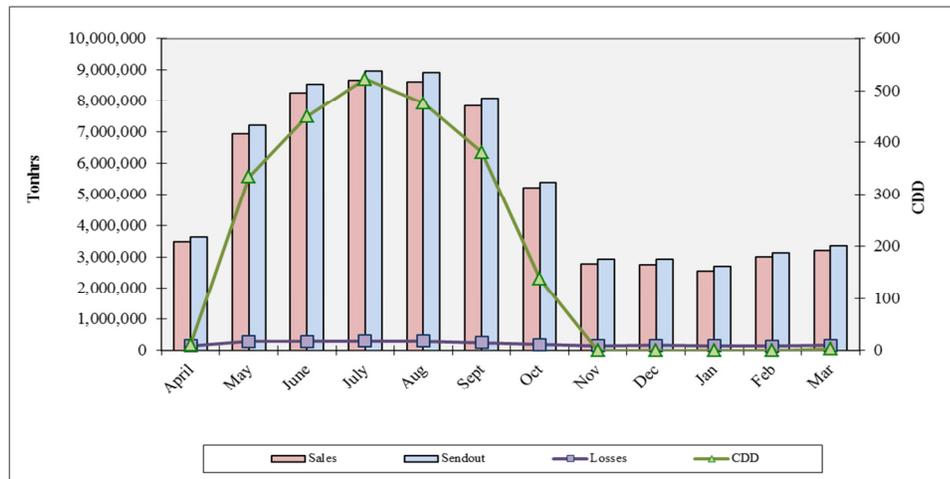


Figure 2. Chilled Water Sales, Sendout, Losses and CDD for the Previous Twelve Months

2. Losses

A comparison of the total, chilled water energy losses in the EDS for the Third Quarter is shown in Figure 3. These losses are the difference in chilled water sendout and sales.

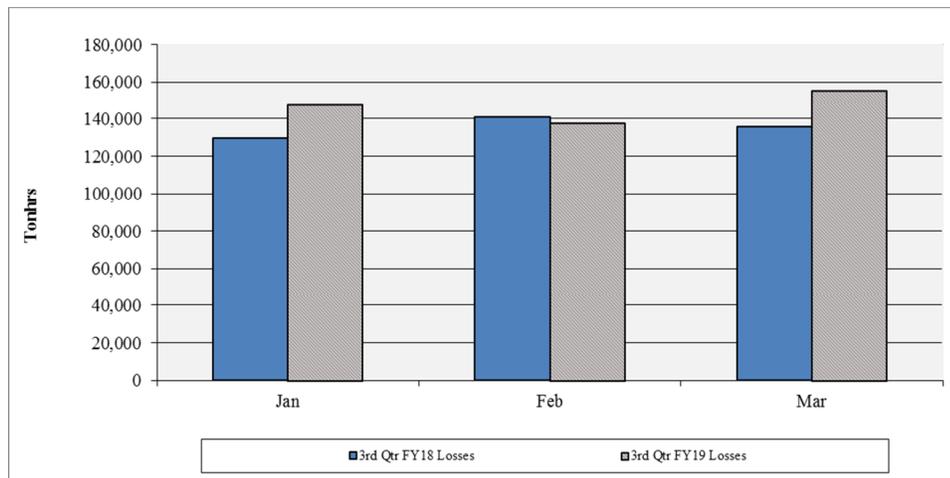


Figure 3. Chilled Water System Loss Comparison

The EDS make-up decreased by 22.7% over the previous Third Quarter. This decrease is due largely to the repair of the two leaks discovered during the Second Quarter. Isolation testing in the area of 5th Ave N and Union St did not reveal any additional significant leaks. TEG and CNE are still investigating the sources of the leaks.

The make-up to the cooling towers decreased approximately 7.6% during the quarter. The number of cycles of concentration in the condensing water circuit

remained approximately the same as the previous quarter. The overall city water make-up comparison for the chilled water system is shown in Figure 4.

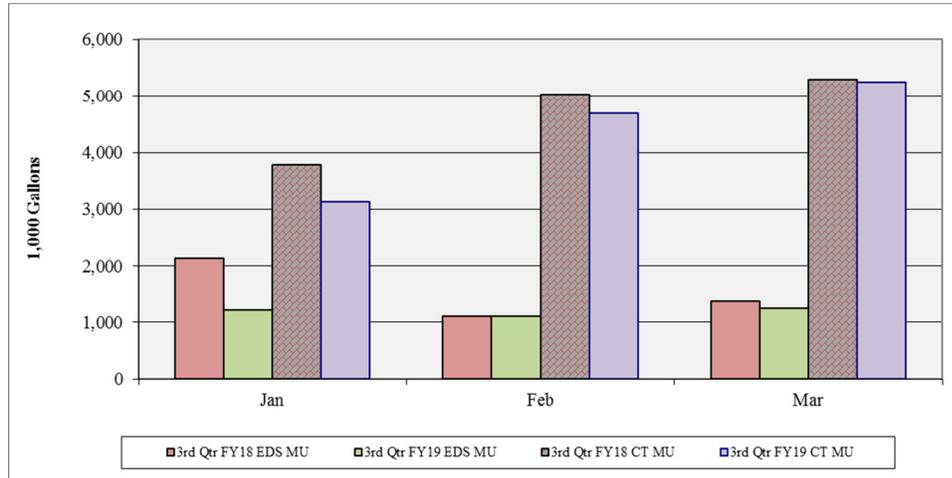


Figure 4. Chilled Water System City Water Usage Comparison

3. Performance

The performance of the chilled water aspect of the EGF is presented by the following two charts, Figures 5 and 6, for the previous twelve months. Under the management of CNE, the System Performance Guarantee levels as described in the ARMA are being achieved satisfactorily.

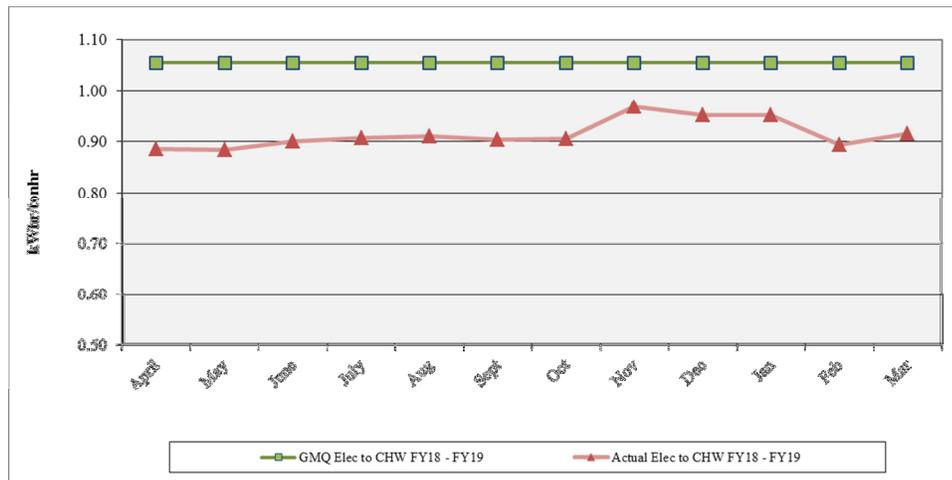


Figure 5. Chiller Plant Electric Performance Guarantee Comparison for the Previous Twelve Months

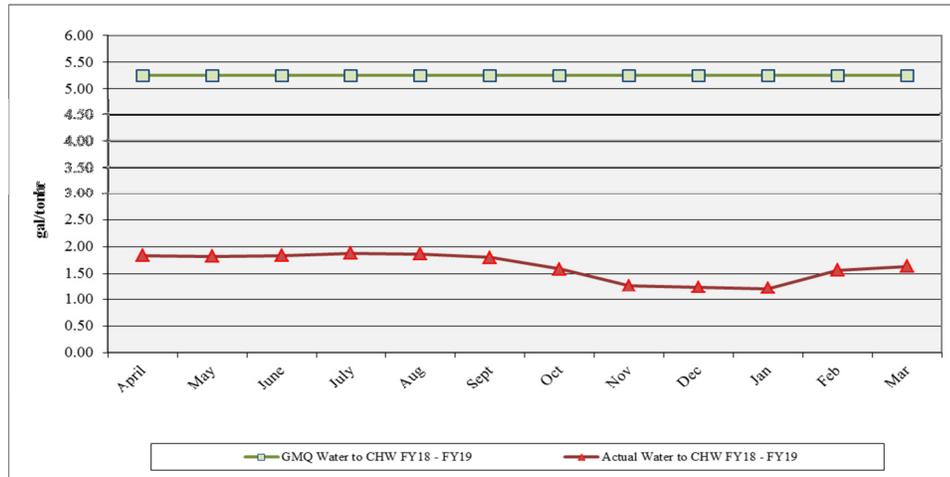


Figure 6. Chiller Plant Water Consumption Performance Guarantee Comparison for the Previous Twelve Months

The chilled water allocation of the electric consumption falls under the GMQ limit of 1.055 kWhr per tonhr for the current quarter, and no excursion is reported for the current fiscal year. The electric usage per unit of sales increased 2.0% over the previous Third Quarter. The total consumption of city water for the chiller plant for the current quarter decreased 11.3%.

B. Steam

1. Sales and Sendout

The steam sendout increased by approximately 3.3% over the previous Third Quarter (FY18), and the sales also increased by approximately 3.2%. The Quarter experienced a 3.4% decrease in the number of heating degree days. The steam system losses increased 5.7% over the previous Third Quarter. A comparison for the Third Quarter steam sales is shown in Figure 7.

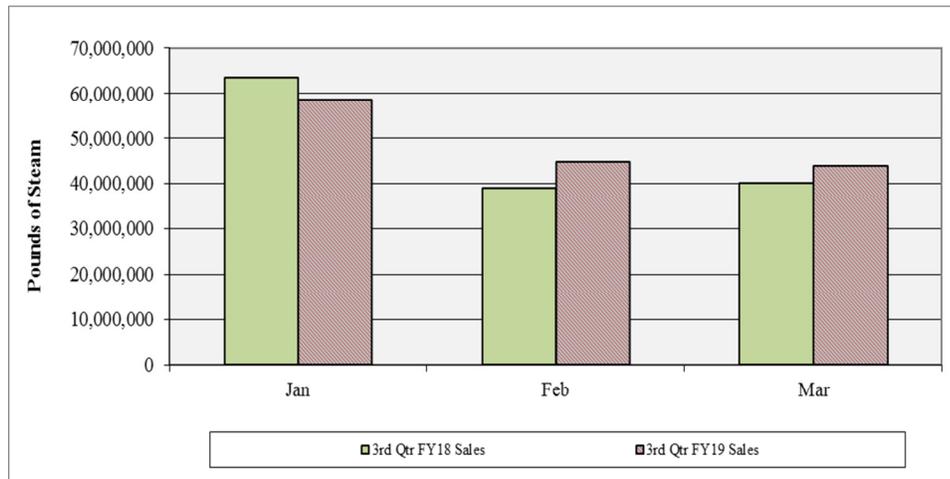


Figure 7. Steam Sales Comparison

The peak steam demand for the current quarter was 142,594 pph, which reflects an approximate 5.3% decrease in the peak steam production over the previous Third Quarter.

Figure 8 shows the steam sales, sendout and losses for the previous twelve months. The losses on this figure are defined as the difference in pounds per month between the recorded sendout and sales values and represent the total mass loss in the EDS between the EGF and the customer meters.

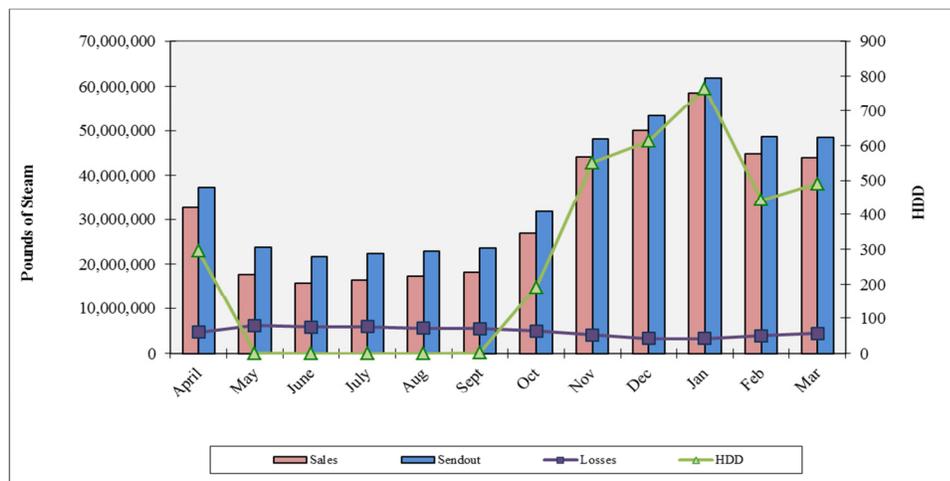


Figure 8. Steam Sales, Sendout, Losses and HDD for the Previous Twelve Months

2. Losses

A comparison of the total steam mass losses in the EDS for the Third Quarter is shown in Figure 9. The mass loss is caused by the heat loss in the EDS between the EGF and the customer meters, resulting in a mass loss at steam traps. Faulty

traps, steam leaks or meter error could also be a contributing cause of these losses. Whenever steam sales decrease from the previous quarter, the percent of system losses can be expected to increase since the majority of these losses are based on a near constant heat loss of the system.

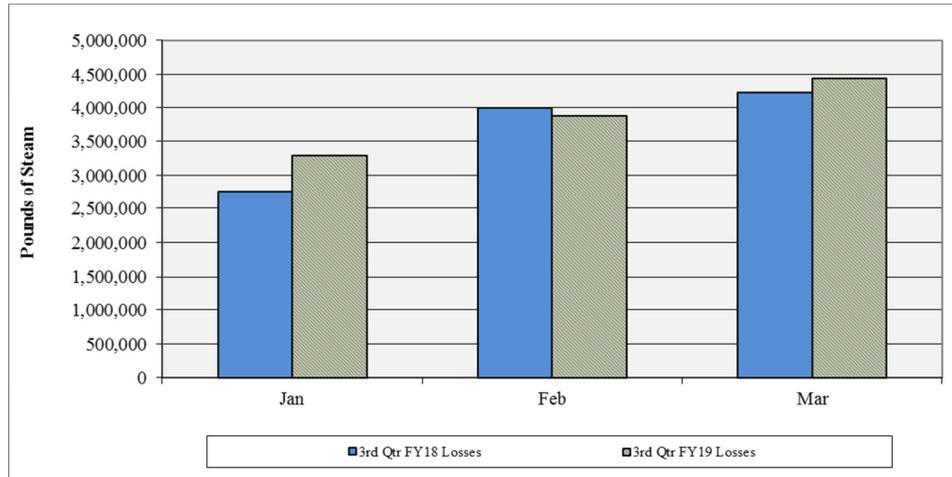


Figure 9. Steam System Losses

The amount of city water make-up (MU) to the steam system consists of the loss in mass between the EGF and the customers, in the condensate return from the customers to the EGF and losses at the EGF. This data is shown in the comparison of Third Quarter data in Figure 10.

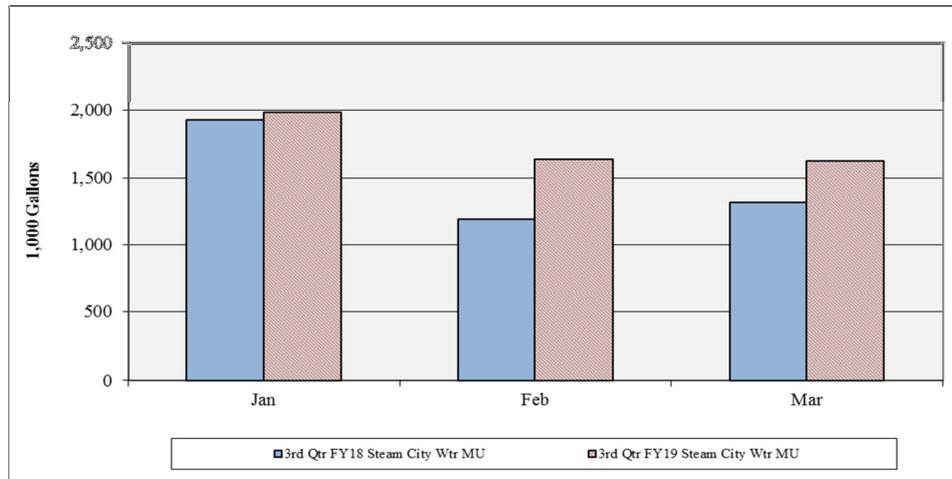


Figure 10. Steam System City Water Make-up Comparison

3. Performance

The performance of the steam system of the EGF is presented by the following three charts, Figures 11, 12 and 13. Under the management of CNE, the System

Performance Guarantee levels as described in the ARMA are being achieved satisfactorily.

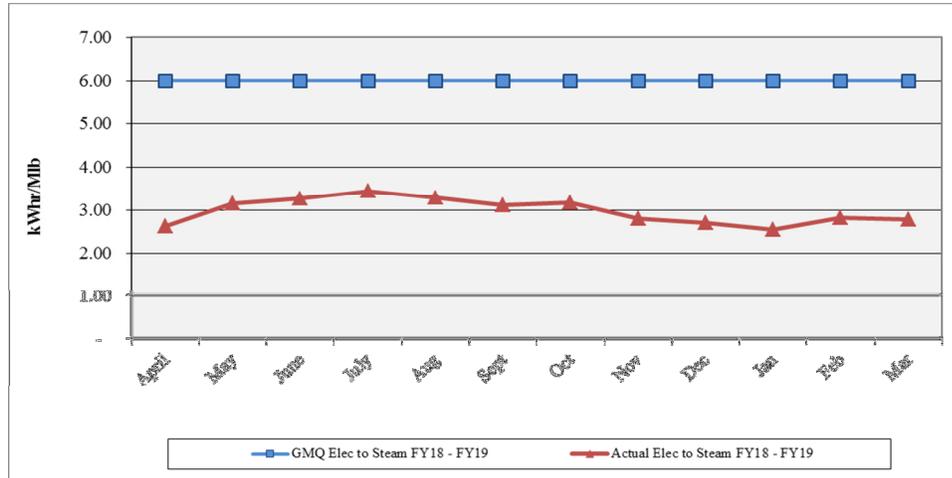


Figure 11. Steam Plant Electric Performance Guarantee for the Previous Twelve Months

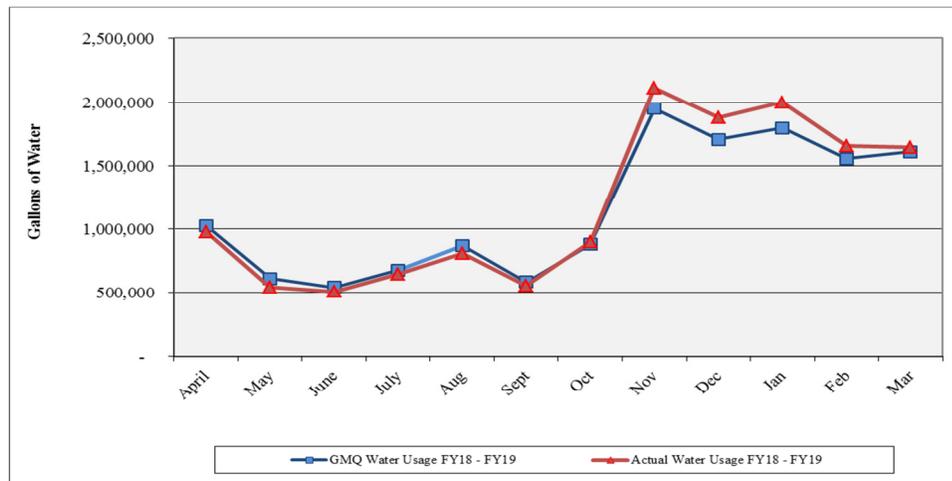


Figure 12. Steam Plant Water Performance Guarantee for the Previous Twelve Months

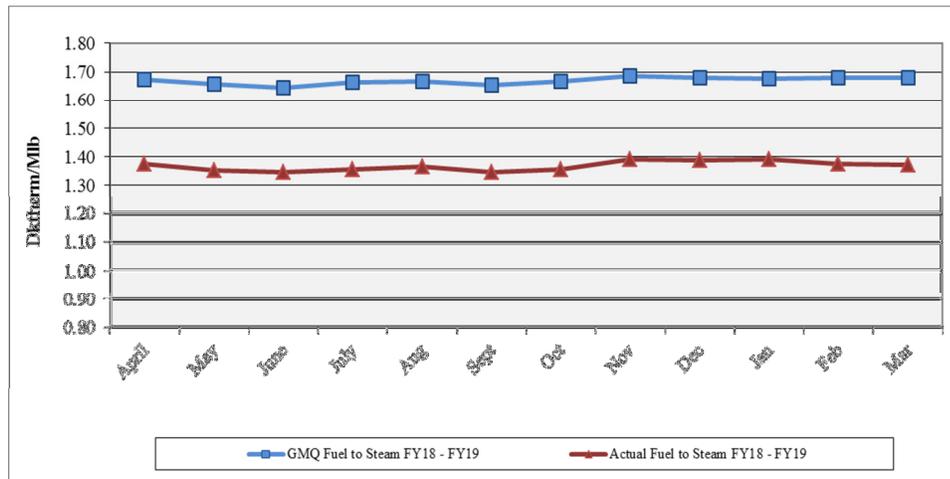


Figure 13. Steam Plant Fuel Performance Guarantee for the Previous Twelve Months

The current quarter experienced a 7.7% increase in the steam plant electric consumption while experiencing a 4.4% increase in the electric conversion factor. The water consumption for the steam plant increased 18.4% this quarter as compared to the previous Third Quarter. The fuel consumption per unit of steam sales was 1.1% higher than in the previous Third Quarter.

C. Contract Guarantee Performance

The production and sales performance for the EGF and EDS are summarized in Table 1 for the current quarter. Additional parameters, such as cooling tower blow-down and peak demands are listed in this table, as well. Table 2 presents the Third Quarter comparisons of the Guaranteed Maximum Quantities (GMQ) of the criteria commodities (fuel, water and electricity).

Table 1. Third Quarter FY19 Production, Sales and Consumption Summary

Item	Unit	Third Quarter FY19	Third Quarter FY18	*Percent Difference
	days	90	90	0.00%
Total Electric Use	kWhrs	8,435,549	7,972,096	5.81%
Chilled Water	kWhrs	8,039,312	7,604,198	5.72%
Steam	kWhrs	396,237	367,898	7.70%
Total Water Use	kgal	21,843	23,136	-5.59%
Total Chilled Water	kgal	16,600	18,709	-11.27%
EDS Make-up	kgal	3,550	4,591	-22.67%
Cooling Towers	kgal	13,050	14,118	-7.56%
Calc CT Evaporation	kgal	11,352	12,266	-7.45%
CT Blowdown	kgal	1,698	1,852	-8.32%
Calc # Cycles		6.69	6.62	0.94%
Steam	kgal	5,243	4,427	18.43%
Total Fuel Use	mmBTU	219,677	210,349	4.43%
Natural Gas	mmBTU	219,498	210,324	4.36%
Propane	mmBTU	278	25	1012.00%
Condensate Return	kgal	15,182	15,113	0.46%
	lbs	123,820,484	123,257,730	0.46%
Avg Temp	°F	175.0	174.7	0.19%
Sendout				
Chilled Water	tonhrs	9,197,400	8,856,100	3.85%
Steam	lbs	158,976,000	153,834,000	3.34%
Peak CHW Demand	tons	11,746	10,929	7.48%
Peak Steam Demand	lb/hr	142,594	150,565	-5.29%
CHW LF		36.25%	37.52%	-3.37%
Steam LF		51.62%	47.30%	9.12%
Sales				
Chilled Water	tonhrs	8,756,478	8,450,272	3.62%
Steam	lbs	147,374,471	142,856,897	3.16%
Losses				
Chilled Water	tonhrs	440,922	405,828	8.65%
Steam	lbs	11,601,529	10,977,103	5.69%
		7.30%	7.14%	2.27%
Degree Days				
CDD		3	23	-86.96%
HDD		1,700	1,759	-3.35%

*positive percent difference values imply an increase from FY18 to FY19

Table 2. Third Quarter FY19 Performance Guarantee Comparison for Steam and Chilled Water

GMQ Calculations	Unit	Third Quarter FY19	Third Quarter FY18	*Percent Difference
Steam				
GMQ Elec Conversion	kWhr/Mlb	6.00	6.00	
Electric Conversion	kWhr/Mlb	2.69	2.58	4.40%
GMQ Plant Efficiency	Dth/Mlb	1.678	1.674	
Plant Efficiency	Dth/Mlb	1.382	1.367	1.06%
Actual %CR		77.89%	80.12%	-2.79%
Avg CR Temp	°F	175	175	0.19%
GMQ Water Conversion	gal	4,957,036	4,311,348	
Water Conversion	gal	5,295,430	4,471,270	18.43%
Chilled Water				
GMQ Elec Conversion	kWhr/tonhr	1.055	1.055	
Electric Conversion	kWhr/tonhr	0.918	0.900	2.03%
GMQ Water Conversion	gal/tonhr	5.25	5.25	
Water Conversion	gal/tonhr	1.90	2.21	-14.38%

*positive percent difference values imply an increase from FY18 to FY19

D. Operating Costs

The fixed operating costs for the DES include the management fee to CNE, debt service payments on the bonds and engineering and administration costs and are charged to the customers relative to their contract demand. The variable costs are dependent on the amounts of steam and chilled water produced and sold to the customers. These latter costs include the utility and chemical treatment costs. The vast majority of the costs incurred for the operation of the DES are passed onto the customers in the form of the demand charges (fixed costs) and energy charges (variable costs). A summary of the total operating costs for the fiscal year to date are shown in Table 3.

The revenues shown reflect the charges to the customers for their respective steam and chilled water service. The difference between the total costs and revenues from the customers is the shortfall that must be paid by Metro. The shortfall exists due to the remaining capacity at the EGF that was included in the original construction and remains unsold and the debt service for bonds to which the customers do not directly contribute.

The current fiscal year system operating costs to date are \$15,450,833. This value represents approximately 74% of the total budgeted operating cost for FY19. The customer revenues from the sales of steam and chilled water for FY19 (to date) are \$13,689,119 which is approximately 71% of the budgeted amount. The difference

between the operating costs and customer revenue is the Metro funding amount (MFA), which represents the shortfall in cash flow for the system. The MFA transferred to date for FY19 is \$1,640,300 (10% of budget) and includes the Fourth Quarter transfer amount. However, the actual MFA required cannot be accurately calculated due to outstanding invoices as of the date of this report.

Table 3. DES Expenses and Revenues to Date

Item	FY19 Budget	First Quarter Expenses	Second Quarter Expenses	Third Quarter Expenses	Fourth Quarter Expenses	Total Spending to Date	% of Budget
Operating Management Fee							
FOC: Basic	\$ 4,563,000	\$ 1,130,774	\$ 1,123,246	\$ 1,080,773	\$ -	\$ 3,334,792	73.08%
9th Chiller	\$ 42,800	\$ 10,595	\$ 10,595	\$ 10,595	\$ -	\$ 31,786	74.27%
C/O 6A	\$ 84,400	\$ 20,919	\$ 20,919	\$ 20,919	\$ -	\$ 62,756	74.36%
C/O 6B	\$ 73,900	\$ 18,314	\$ 18,314	\$ 18,314	\$ -	\$ 54,941	74.34%
C/O 7	\$ 27,800	\$ 6,899	\$ 6,899	\$ 6,899	\$ -	\$ 20,698	74.45%
C/O 8	\$ 12,100	\$ 3,019	\$ 3,019	\$ 3,019	\$ -	\$ 9,058	74.86%
Pass-thru Charges: Chemical Treatment	\$ 245,700	\$ 55,185	\$ 60,532	\$ 50,851	\$ -	\$ 166,568	67.79%
Insurance	\$ 21,200	\$ -	\$ 5,178	\$ -	\$ -	\$ 5,178	24.42%
Marketing: CNE Sales Activity	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	n.a.
Incentive Payments	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	n.a.
FEA: Steam	\$ 66,400	\$ 17,451	\$ 37,309	\$ 42,389	\$ -	\$ 97,149	146.31%
Chilled Water	\$ 186,400	\$ 134,260	\$ 55,261	\$ 49,024	\$ -	\$ 238,545	127.98%
Misc: Metro Credit	\$ -	\$ (233,952)	\$ (133,181)	\$ (146,175)	\$ -	\$ (513,308)	n.a.
ARFA	\$ 64,800	\$ 16,423	\$ 16,423	\$ 16,423	\$ -	\$ 49,268	76.03%
Deferral	\$ -	\$ -	\$ -	\$ (90,718)	\$ -	\$ (90,718)	n.a.
Subtotal - Man Fee =	\$ 5,388,500	\$ 1,413,839	\$ 1,357,696	\$ 1,208,487	\$ -	\$ 3,980,022	73.86%
Reimbursed Management Fee + Chem Treatment		\$ 1,413,839	\$ 1,352,518	\$ 406,876	\$ -	\$ 3,173,233	0.00%
Metro Costs							
Pass-thru Charges: Engineering	\$ 26,300	\$ 6,785	\$ 16,532	\$ 7,088	\$ -	\$ 30,406	115.61%
EDS R&I Transfers	\$ 281,700	\$ 70,425	\$ 70,425	\$ 70,425	\$ 23,475	\$ 234,750	83.33%
Metro Marketing	\$ 10,900	\$ -	\$ -	\$ -	\$ -	\$ -	0.00%
Project Administration	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	n.a.
Metro Incremental Cost	\$ 554,900	\$ 164,631	\$ 123,203	\$ 160,296	\$ 9,107	\$ 457,237	82.40%
Utility Costs: Water/Sewer	\$ 654,200	\$ 214,678	\$ 116,093	\$ 132,004	\$ -	\$ 462,775	70.74%
EDS Water/Sewer	\$ -	\$ 40	\$ 148	\$ 309	\$ -	\$ 498	n.a.
EDS Electricity	\$ 39,800	\$ 19,274	\$ 17,256	\$ 14,171	\$ -	\$ 50,701	127.39%
Electricity	\$ 5,537,600	\$ 1,997,041	\$ 925,358	\$ 789,020	\$ -	\$ 3,711,418	67.02%
Natural Gas Consultant	\$ 12,400	\$ 3,000	\$ 3,000	\$ 2,000	\$ -	\$ 8,000	64.52%
Natural Gas Transport	\$ -	\$ 59,610	\$ 101,391	\$ 117,623	\$ -	\$ 278,624	n.a.
Natural Gas Fuel	\$ 2,865,900	\$ 264,902	\$ 656,190	\$ 693,683	\$ -	\$ 1,614,775	56.34%
Propane	\$ -	\$ 10,704	\$ -	\$ 59,992	\$ -	\$ 70,696	n.a.
Subtotal - Metro Costs =	\$ 9,983,700	\$ 2,811,090	\$ 2,029,597	\$ 2,046,612	\$ 32,582	\$ 6,919,881	69.31%
Subtotal - Operations =	\$ 15,372,200	\$ 4,224,929	\$ 3,387,293	\$ 3,255,099	\$ 32,582	\$ 10,899,902	70.91%
Debt Service							
2012 Bonds	\$ 3,478,200	\$ 871,313	\$ 868,963	\$ 868,963	\$ -	\$ 2,609,238	75.02%
2005 Bonds - Self Funded	\$ 716,800	\$ 667,444	\$ -	\$ 49,323	\$ -	\$ 716,768	100.00%
2007 Bonds - Self Funded	\$ 187,300	\$ 46,825	\$ 46,825	\$ 46,825	\$ 46,825	\$ 187,300	100.00%
2008 Bonds - Self Funded	\$ 186,900	\$ 46,725	\$ 46,725	\$ 46,725	\$ 46,725	\$ 186,900	100.00%
2010 Bonds - Self Funded	\$ 188,000	\$ 47,000	\$ 46,725	\$ 47,000	\$ 47,000	\$ 187,725	99.85%
Fund 49107 - Self Funded	\$ 663,000	\$ 165,750	\$ 165,750	\$ 165,750	\$ 165,750	\$ 663,000	100.00%
MIP	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	n.a.
Oper. Reserve Fund	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	n.a.
Subtotal - Capital =	\$ 5,420,200	\$ 1,845,057	\$ 1,174,988	\$ 1,224,586	\$ 306,300	\$ 4,550,930	83.96%
Total =	\$ 20,792,400	\$ 6,069,986	\$ 4,562,280	\$ 4,479,685	\$ 338,882	\$ 15,450,833	74.31%
Customer Revenues							
Taxes Collected		\$ 102,554	\$ 88,884	\$ 83,590	\$ -	\$ 275,027	n.a.
Taxes Paid		\$ 102,554	\$ 88,883	\$ 56,556	\$ -	\$ 247,993	n.a.
Interest & Misc Revenue	\$ 153,600	\$ 36,969	\$ 50,843	\$ 59,523	\$ -	\$ 147,335	95.92%
Penalty Revenues/Credits		\$ 53,355	\$ 19,984	\$ (57,422)	\$ -	\$ 15,918	n.a.
Energy Revenues Collected		\$ 5,031,755	\$ 4,307,520	\$ 4,159,557	\$ -	\$ 13,498,832	71.23%
Revenues =	\$ 19,152,100	\$ 5,122,079	\$ 4,378,348	\$ 4,188,692	\$ -	\$ 13,689,119	71.48%
Metro Funding Amount =	\$ 1,640,300	\$ 947,908	\$ 183,932	\$ 290,993	\$ 338,882	\$ 1,761,714	107.40%

The DES serves 28 customers and 40 buildings in downtown Nashville. These customers are divided into three categories: 1) Privately owned buildings, 2) State of TN owned buildings and 3) Metro owned buildings. A summary of the annual costs for each of these three categories is presented in Table 4. These values include late fees and penalties and any unpaid balances.

Table 4. Customer Revenue Summary to Date

Building	Chilled Water			Steam		
	Total Cost	Consumption (tonhrs/yr)	Unit Cost (\$/tonhr)	Total Cost	Consumption (Mlb/yr)	Unit Cost (\$/Mlb)
Private Customers	\$ 2,833,988	14,054,863	\$ 0.2016	\$ 1,232,716	87,827	\$ 14.0358
State Government	\$ 2,491,869	9,968,491	\$ 0.2500	\$ 1,496,638	102,414	\$ 14.6136
Metro Government	\$ 3,867,333	20,619,788	\$ 0.1876	\$ 1,576,325	132,666	\$ 11.8819
New Customers	\$ 2,509,256	13,913,457	\$ 0.1803	\$ 1,096,094	103,754	\$ 10.5644
Total	\$ 9,193,190	44,643,142	\$ 0.2059	\$ 4,305,678	322,906	\$ 13.3341

Total Revenue \$ 13,498,868
 True-up and Adjustments (Net) \$ 190,251
 Net Revenue \$ 13,689,119

III. EGF Operations

Items relating to the facility operations presented herein are derived from the monthly reports issued by CNE for FY19. Communication between TEG and CNE continues to be excellent, and CNE has reported and managed all EGF operations satisfactorily and according to the ARMA with no contract violations.

A. Reliability

The principle issues surrounding the reliable operation of the EGF relates to the ability to operate without significant interruption, exclusive of planned outages, and disruption of service to the customers. The following disruptions in service occurred during the quarter.

- On January 15 and 22, the chilled water temperature was above the 43.3 °F guarantee for 34 minutes and 60 minutes, respectively. Both of these excursions were the result of swapping chillers to perform annual maintenance. The highest temperature reading during these times was 44.2°F.
- On January 21, the steam pressure dropped below 150 psig for approximately 105 minutes due to an issue with the damper controller on boiler #4 that would not allow the firing rate to exceed 55%. This issue has been repaired.
- On February 18th, the chilled water temperature was above the 43.3 °F for approximately 7 hours due to the scheduled chilled water outage to replace valves in the EGF. The outage was scheduled for 12 hours but was completed early.
- On March 9, a lightning strike caused Switch Gear 1A to trip off line. The EGF equipment was immediately re-started. Steam pressure was below 150 psig for approximately 60 minutes, reaching a low of 102 psig. The chilled water temperature was above 43.3 °F for approximately 16 minutes. SWG 1A was rebuilt.

B. Efficiency

The operation of the EGF satisfied the guaranteed levels for all commodity usage during the quarter. There were no significant excursions above the guaranteed levels for the current quarter. A more detailed discussion of the contract guarantee performance was presented previously in this report.

C. Environment, Health and Safety

No environmental violations were reported during the quarter.

Monthly safety meetings were held on Lock-Out/Tag-Out, Safe Work Practices and Vehicle and Elevated Work Safety.

D. Personnel

The EGF currently had twenty-one full time employees, one part-time employee and two relief staff. Of the current number of employees, seventeen were previously employed by Nashville Thermal Transfer Corporation.

E. Training

Staff training for this quarter consisted of the Health and Safety training discussed previously.

F. Water Treatment

The water treatment program consists of regular testing and monitoring of the water chemistry in the steam, chilled water and condensing water systems. Chemicals are added to control the water hardness, chlorine levels and biologicals. Remote testing of the condensate at the AA Birch, Tennessee Tower and the Andrew Jackson also occurs regularly to monitor the concentration and distribution of the steam system chemicals.

- Steam System
 - The condensate return averaged approximately 77.9% of the steam sendout during the quarter, which represents a 2.8% decrease over the previous Third Quarter.
 - Feedwater iron, pH and hardness remained excellent during the quarter.
- Condensing Water System
 - The conductivity of the condensing water continues to be normal with only a few excursions resulting in high cycles of concentration and low blowdown rates.
- Chilled Water System
 - CNE continues to monitor and test for the presence of bacteria in the system. The continuous dosage of the biocide continues. At this point,

the biological growth in the system, as measured at the EGF and at the customer buildings, has become essentially non-existent.

- The project to install a side stream filter at the EGF remains on hold pending funding from Metro.

G. Maintenance and EGF Repairs

CNE continues to report on the numerous routine maintenance and preventive maintenance activities performed on the EGF primary and ancillary equipment. The principle items are discussed herein as they relate to the repair, maintenance or replacement of equipment or devices at the facility and are not considered extraordinary. The cost for these items is included as part of the FOCs.

- Checked and repaired computers and servers
- Repaired lighting
- Repaired and insulated cooling tower equalizing line
- Installed rebuilt motor on condensing water pump #2
- Checked and adjusted packing on all pumps
- Replaced leaking section of cooling tower makeup line
- Repaired MBC-449 Chemical Tank
- Replaced boiler #3 flame scanner
- Repaired faucet on lab sink
- Repaired Genie Lift
- Adjusted belt on cooling tower #4
- Replaced gauges on various pumps
- Repaired boiler #3 feed water valve
- Repaired starter on boiler feed water pump #3 motor
- Replace isolation valves on chiller #5 during the scheduled outage
- Replaced sensor in burner O₂ analyzer
- Checked/replaced softener controls
- Repaired chilled water makeup meter
- Assist Metro Water Services repair leak on plant water meter
- Repaired low water cut out switch on boiler #1
- Repaired oil pump on chiller #7
- Replace purge sensor on chiller #4B
- Replaced damaged ceiling tiles in hallway
- Repaired actuator and repaired valve on cooling tower #17
- Cleaned evaporator flow tube on chiller #2
- Repaired regulator on chiller #6
- Repaired drain on cooling tower #18
- Painted chiller condenser covers
- Repaired starter on boiler feed water pump #3 motor
- Assisted Metro Water Services replace plant water meter scanner

- Moved furniture/stripped and waxed tile/shampooed carpets
- Repaired man-lift
- Painted chillers
- Repaired actuator on chiller #5
- Repaired starter on cooling tower #13
- Adjusted belts on cooling tower #12
- Repaired valve on chiller evaporator #9
- Replaced fan shaft and bearings on cooling tower #5
- Repaired boiler blow #3 down meter
- Forklift Systems repaired boom lift
- Repaired SWG 1A
- Repaired refrigerant alarm
- Re-certified test equipment
- Other repairs, maintenance and preventative maintenance were made during the quarter and are listed in the monthly reports issued by CNE.

H. EGF Walk-through

A quarterly Walk-through of the EGF was performed on March 26, 2019, by Kevin Jacobs, P.E. with TEG. This review involved a tour of the facility with the primary points of interest and concern noted herein. The items noted in this section need to be completed prior to the end of the operating contract for the System Operator in accordance with the ARMA paragraph 12.03.

- During the Fourth Quarter FY17 Walkthrough report, it was noted that additional rust spots were observed on cooling towers #1, #5, #6, #11, #16 and #18. CNE has not made the repairs on the riser tubes. In addition, cooling tower fill being stored on the cooling tower deck beneath the basins has been noted by CNE as being of the new style. No old or damaged fill is currently being stored. No additional work has been performed on the riser tubes since the First Quarter Walkthrough FY18.
- CNE has made an effort to remove cobwebs within the EGF; however, this removal process is ongoing.
- In previous Walkthrough reports, it was noted that significant scale was observed on the fill (louvers) to several of the cooling towers. The scale remains on these cooling towers and most of the cells along the west-side of the plant now have significant scale or deposits on the fill (louvers). CNE does not appear to have addressed this issue since first being noted in the Fourth Quarter FY17 Walkthrough report. The scaling has increased and is apparent on most of the cooling towers. CNE needs to have their water treatment contractor to provide Metro a report explaining why the scale is forming and what actions need to be taken to remedy the issues.
- In previous Walkthrough Reports, it was noted that a drain valve on the condensing water header on the northeast corner of the cooling tower deck was

frozen and had apparently been leaking. CNE repaired this valve, installed a cap and insulated it during the quarter.

- In previous Walkthrough reports, it was noted that a leaking chemical feed line was observed on the south side of the southern DA. CNE has repaired the leak but has not cleaned the area affected by the spill.
- The leak in the water line in the ceiling west of boiler #4 was repaired during the quarter and the piping was re-insulated.
- Four of the sycamore trees on the west side of the EGF appear to have died. One smaller tree on the north side of the building has died and CNE has removed the carcass. CNE needs to cut down and remove the dead trees and replace them. Since the current plan regarding Crockett Street does not involve the west side of the EGF where the trees are located, CNE needs to address the issue with the trees.
- Water was noted leaking from the upper portions of CT14 along the southwest corner of the tower during the walkthrough. Water was also dripping from beneath CT14 along the north side of the tower onto structural steel and near the connection for the equalizing line. Upon further review of CT14, a 0.75" PVC line inside the tower was broken near a fitting and was dumping water along the north face of the inside of the tower. CNE was informed of these issues and plans to address them soon
- Graffiti noted in previous reports on the west side of the EGF has been removed. However, someone had pitched a tent on the west side of the EGF. CNE was notified and intends to address this issue.
- Pallets were noted stacked on the mezzanine level near the water treatment area. CNE was notified and intends to address the issue
- Algae appear to be present in the low points on the roof deck. Trash has collected on some roof drains and a bag of trash was noted near CT18. CNE was notified and intends to address these issues.
- Other action items previously noted to be addressed by CNE have been completed.

IV. Capital Projects

The Capital Projects discussed in this section are those projects funded through the issuance of bonds by Metro. Costs for these projects will be paid from funds already appropriated. The statuses of the projects are discussed, and the project cost-to-date and bond balances are also presented.

A. Third Quarter FY19 Open Projects

The following projects remained open at the end of the Third Quarter FY19.

1. DES111 – DES Combined Heat and Power

This project is currently on hold.

2. DES124 - Criminal Justice Center Redevelopment

TEG has prepared a reimbursement request to Metro General Services for the costs incurred by DES due to the demolition and re-construction of the CJC.

3. DES133.1 - Old Convention Center Site Redevelopment: Monitoring of Broadway Tunnel

This project involved the monitoring/reporting on the condition of the Broadway Tunnel related to the construction and blasting at the 5th + Broadway Development. Because the City is pursuing reimbursement from the contractor(s) responsible for the blasting and damage to the tunnel, including the need for the City to reinforce the tunnel and make subsequent repairs after the completion of the blasting, this project remains open. The repairs for tunnel damage were completed under project DES-164.

4. DES135 – CHW Leak at 5th and Union

Per TEG's request, CNE has conducted two additional partial chilled water isolations in an attempt to identify areas in the system responsible for the current chilled water leakage. These partial isolations occurred on March 26 and March 28, 2019. Neither of these isolations resulted in data which suggests there are any DES chilled water leak(s) within these two isolated areas.

TEG and CNE will continue to monitor the system and its make-up rate. TEG will also remain in contact with the water department regarding the replacement of the water main in 5th Avenue North, one block south of the JK Polk Building.

5. DES139 – DES Options Review

As a response to the solicitation of bids for the Implementation Scenarios for Metro's DES Program Options (RFQ#1044673), Metro issued their intention to award Engie Development, LLC on March 22, 2019. The proposal from bidder included the purchase of the Metro DES for \$60,000,000. The award is contingent upon successful contract negotiations.

This project will remain open since TEG and Metro will continue to work together during the transition period to ensure the needs of the DES customers are met.

6. DES144 – Manhole 6 Repair

This project was closed during the Third Quarter FY19.

7. DES149 – Hot Spot at 1st and Molloy

This project was closed during the Third Quarter FY19.

8. DES151 – Manhole 23 Repairs

The work on this project was substantially complete on March 23, 2019. Additional items needing repair were discovered during the execution of the work, therefore, change directives were issued and cost substantiation information is now under review.

It is anticipated that this project will be closed during the Fourth Quarter FY19.

9. DES152 – Manhole A and Manhole M Coating Repairs

The structural steel in these manholes were cleaned and painted as part of DES107 in 2015. Portions of the paint is now flaking and coming off of these supports. The paint manufacturer reviewed the failing coatings. Their position is that the surface preparation and paint application was at fault. However, TEG employed a painting inspector during this work and records were maintained regarding the ambient conditions, surface preparation and coating application process. Even with this evidence, the paint manufacturer is not willing to warrant the work. Before the existing corrosion progresses, these coating failures need to be repaired, and this project addresses these needed repairs.

This work has been put on hold but is included in the FY20 capital budget request.

10. DES153 – Manhole L Repairs

The structural steel in Manhole L is corroded and needs to be cleaned and painted to prevent any additional corrosion. Additionally, the condensate piping in this manhole experiences fairly severe hammering and the piping configuration needs to be modified to try and alleviate this problem.

TEG started the design for these repairs during the First Quarter FY19. Because of higher priority projects, the design for this project has not been completed. In addition, the main stage for the NFL Draft activities is now on top of this manhole, which would delay the execution of work. It is expected that the design for this project will be completed during the Fourth Quarter FY19.

11. DES154 – Manhole K Repairs

The structural steel in Manhole K is corroded and needs to be cleaned and painted to prevent any additional corrosion.

TEG started the design for these repairs during the First Quarter FY19, however, due to higher priority projects this work has been postponed until FY 2020.

12. DES157 – Manhole 9 Structural Steel Repairs

The structural steel piping supports in Manhole 9 are badly corroded and need to be replaced and/or cleaned and painted to maintain the integrity of the steam and condensate piping system. It is anticipated that the design for this project will be completed during the Fourth Quarter FY19, with the bid and award process thereafter.

13. DES158 – Manhole 18A Structural Steel Repairs

The work for the Manhole 18A scope was substantially complete on March 28, 2019. It is anticipated that this project will be closed during the Fourth Quarter FY19.

A Change Directive was issued on this project because it was discovered that a steam/condensate anchor at the east end of the Broadway Tunnel at Manhole 18 had moved to the east 3 to 4 inches. TEG reviewed the piping/anchor and determined that a partial anchor failure had occurred. TEG also analyzed the piping configuration and determined that additional undesirable movement could occur with this piping which could jeopardize the integrity and operation of the steam and condensate system. TEG completed the design for bracing to be installed in Manhole 18 to prevent the further movement of the steam piping. This work was coordinated with CNE and the Manhole 18A contractor and this bracing was substantially completed on March 19, 2019. Additional work will be required over the summer (during low steam loads) to re-position both the steam and condensate return piping and permanently re-anchor this piping. This additional work will be assigned a new project number.

It is anticipated that the Manhole 18 change directive project will be invoiced and closed during the Fourth Quarter FY19.

14. DES159 – Manhole B2 Structural Steel Repairs

The structural steel piping supports in Manhole B2 are badly corroded and need to be cleaned and painted to maintain the integrity of the steam and condensate piping system. Due to higher priority projects, this project was delayed. It is anticipated that this project will be bid during the Fourth Quarter FY19.

15. DES160 – New Service to 5th + Broadway Development

This project was bid and awarded during the quarter. The work was completed on February 28, 2019. The instrumentation and metering system was purchased by CNE during the quarter and is expected to be installed by the building's contractor in the Fourth Quarter FY19. Chilled water service during construction is anticipated. However, the building's substantial completion date is not expected to be until January 2020, at which time, the normal service will begin to the conditioned spaces within the building.

16. DES161 – Manhole S6 Insulation

This project addresses the installation of insulation in Manhole S6 which is a small manhole in the State distribution system. It is anticipated that this work will take place during the 4th Quarter FY19. (This project was formerly included in DES143.)

17. DES162 – Service to New Hotel at 3rd Ave & Molloy

Conversations and CSA negotiations continued through the quarter with this potential customer. The customer has verbally committed to chilled water service from DES and an executed CSA is expected during the Fourth Quarter FY19.

18. DES163 – New Service to MDHA Parcel K

Negotiations with this potential customer are in the early stages.

19. DES164 – Broadway Tunnel Repairs

Construction began and was completed during the Third Quarter FY19. It is anticipated that this project will be closed during the Fourth Quarter FY19.

20. DES165 – AA Birch Tunnel Repairs

Construction began and was completed during the Third Quarter FY19. It is anticipated that this project will be closed during the Fourth Quarter FY19.

21. DES166 – Miscellaneous Tunnel Repairs

Construction began and was completed during the Third Quarter FY19. It is anticipated that this project will be closed during the Fourth Quarter FY19.

22. DES167 – EDS Tunnel Fiber Optic Installation

TEG was contacted by the Department of Public Works to explore the possibility of installing fiber optic cables in the Broadway Tunnel for the NFL Network to utilize during the NFL Draft to be held in Nashville.

On-site meetings were held with contractor representatives for the NFL. Preliminary pricing was obtained from a CNE approved contractor and this pricing was presented to the NFL contractor. Based on the presented pricing, the NFL contractor determined that utilizing the tunnel was cost prohibitive. This project is now closed.

B. Third Quarter FY19 Closed Projects

DES144 and DES149 were closed during the Third Quarter FY19.

C. Capital Projects Budget

The following table summarizes the costs and remaining balance of the DES capital projects based on reported expenditures to date. Open projects or completed projects that require some additional management are shown. Total costs for projects that are closed are shown with a gray highlight. Only the funds currently available are shown.

Table 5. Capital Projects Expense Summary

	DES Project #	Description	Total Budget	FY19 Spending to Date	Total Spent to Date	Remaining Balance
Fund-49109						
	DES119	DES Delta T Issue	\$ 67,000	\$ -	\$ 65,447	\$ 1,553
	DES139	Options Review	\$ 63,600	\$ 44,019	\$ 44,019	\$ 19,581
	MAS	Miscellaneous Development Projects	\$ 46,900	\$ 1,843	\$ 28,842	\$ 18,058
	DES124	CJC Redevelopment	\$ 2,000	\$ 1,843	\$ 1,843	\$ 157
	DES133	NCC Development	\$ 10,000	\$ 7,404	\$ 7,404	\$ 2,596
	DES133.3	Broadway Tunnel Reinforcement	\$ -	\$ 1,427	\$ 1,427	\$ (1,427)
	DES135	Chilled Water Leak 5th and Union	\$ 50,000	\$ 21,323	\$ 21,323	\$ 28,677
	DES148	89 Peabody	\$ 10,000	\$ 5,739	\$ 5,739	\$ 4,261
	DES151	MH 23 Repairs	\$ -	\$ 7,209	\$ 7,209	\$ (7,209)
		Total Closed Projects	\$ 2,493,661	\$ -	\$ 2,405,553	\$ 88,108
		Metro Project Admin	\$ -	\$ -	\$ -	\$ -
		Project Man, Development, etc	\$ (137,246)	\$ -	\$ -	\$ (137,246)
		Total 2010 Bond	\$ 2,605,916	\$ 90,806	\$ 2,588,805	\$ 17,111
Fund-49107						
	DES124	CJC Redevelopment	\$ 300,000	\$ 1,403	\$ 359,271	\$ (59,271)
	DES130	MH B3 Repair	\$ 20,000	\$ -	\$ 1,468	\$ 18,532
	DES133	NCC Development	\$ 40,000	\$ 7,427	\$ 219,513	\$ (179,513)
	DES133.3	Broadway Tunnel Reinforcement	\$ 450,000	\$ 212	\$ 435,735	\$ 14,265
	DES135	Chilled Water Leak 5th and Union	\$ 200,000	\$ 14,872	\$ 192,629	\$ 7,371
	DES138	MH-D	\$ 130,000	\$ -	\$ 121,242	\$ 8,758
	DES148	89 Peabody	\$ 10,000	\$ 7,659	\$ 32,737	\$ (22,737)
		Total Closed Projects	\$ 7,458,827	\$ -	\$ 6,964,044	\$ 494,783
		Metro Project Admin	\$ (129,827)	\$ (0)	\$ 171,140	\$ (300,967)
		Project Man, Development, etc	\$ 21,000	\$ -	\$ -	\$ 21,000
		Customer Connection Fund	\$ 8,500,000	\$ 31,573	\$ 8,497,779	\$ 2,221
Fund-49116						
	DES111	DES CHP	\$ 22,784,277	\$ -	\$ 168,706	\$ 22,615,571
	DES139.1	Options Review	\$ 50,000	\$ 16,493	\$ 16,493	\$ 33,507
	DES151	MH 23 Repairs	\$ 175,000	\$ 9,361	\$ 9,361	\$ 165,639
	DES152	MH A & M Repairs	\$ -	\$ -	\$ -	\$ -
	DES153	MH L Repairs	\$ 110,000	\$ 1,276	\$ 1,276	\$ 108,724
	DES154	MH K Repairs	\$ -	\$ 85	\$ 85	\$ (85)
	DES157	MH 9 Repairs	\$ 75,000	\$ 13,343	\$ 13,343	\$ 61,657
	DES158	MH 18A Repairs	\$ 110,000	\$ 36,935	\$ 36,935	\$ 73,065
	DES159	MH B2 Repairs	\$ 110,000	\$ 6,297	\$ 6,297	\$ 103,703
	DES160	5th + Broadway Service	\$ 60,000	\$ 47,214	\$ 47,214	\$ 12,786
	DES161	MH S6 Insulation	\$ 30,000	\$ -	\$ -	\$ 30,000
	DES162	3rd and Molloy Service	\$ 220,000	\$ 9,052	\$ 9,052	\$ 210,948
	DES163	Parcel K Service	\$ 707,300	\$ 992	\$ 992	\$ 706,308
	DES164	Broadway Tunnel Repairs	\$ 145,000	\$ 174,229	\$ 174,229	\$ (29,229)
	DES165	AA Birch Tunnel Repairs	\$ 115,000	\$ 63,103	\$ 63,103	\$ 51,897
	DES166	Misc. Tunnel Repairs	\$ 195,000	\$ -	\$ -	\$ 195,000
		Total Closed Projects	\$ 15,723	\$ -	\$ 15,723	\$ -
		Metro Project Admin	\$ -	\$ -	\$ -	\$ -
		Project Man, Development, etc	\$ 1,097,700	\$ -	\$ -	\$ 1,097,700
		CHP and EDS Repairs	\$ 26,000,000	\$ 378,379	\$ 562,808	\$ 25,437,192

V. Energy Distribution System Repairs, Improvements, PM and Emergencies

Several EDS repairs and improvements were made during the Third Quarter. The principle items for discussion are presented in the following sections.

A. Repairs and Improvements

Several repairs were made to the EDS and at customer buildings during the quarter. The remaining value of the R&I budget at the end of the current quarter (April 22, 2019) is \$2,694. Tables 6A and 6B provide a summary of the FY19 expenditures and revenues to date associated with the R&I budget.

Table 6A. FY19 Repair and Improvement Expenditure and Revenue Summary

Description	Date	Tracking #	Vendor	Expenditure	Transfers	Net Market Adjustment	Market Value	Balance
Value at end of FY18						\$ -	\$ 104,285.39	\$ 104,285.39
DES-144	7/28/2018	DES-2346	TEG	\$ 1,920.75				
DES-147	7/28/2018	DES-2346	TEG	\$ 407.03				
DES-149	7/28/2018	DES-2346	TEG	\$ 127.28				
DES-151	7/28/2018	DES-2346	TEG	\$ 4,412.21				
DES-152	7/28/2018	DES-2346	TEG	\$ 127.28				
DES-149	9/1/2018	DES-2348	CNE	\$ 88,200.26				
EMR 17-004	8/2/2018	DES-2348	CNE	\$ 5,277.44				
Interest/Transfer	07/02/18	-	-	\$ 185.59				
Interest/Transfer	07/02/18	-	-	\$ (185.59)				
CNE July R&I Invoice	09/01/18	DES-2348	CNE	\$ 2,324.97				
DES-144	08/27/18	DES-2346	TEG	\$ 2,497.71				
DES-149	08/27/18	DES-2346	TEG	\$ 42.43				
DES-150	08/27/18	DES-2346	TEG	\$ 1,718.35				
DES-151	08/27/18	DES-2346	TEG	\$ 8,132.38				
DES-153	08/27/18	DES-2346	TEG	\$ 5,606.40				
DES-154	08/27/18	DES-2346	TEG	\$ 3,648.55				
DES-147 (Reimbursement from Star Construction)	08/17/18	DES-2346	-	\$ (12,918.11)				
Interest/Transfer	08/01/18	-	-	\$ 193.12				
Interest/Transfer	08/01/18	-	-	\$ (193.12)				
CNE Aug R&I Invoice	09/19/18	DES-2351	CNE	\$ 4,017.14				
DES-144	10/01/18	DES-2351	TEG	\$ 4,343.33				
DES-150	10/01/18	DES-2351	TEG	\$ 726.93				
DES-151	10/01/18	DES-2351	TEG	\$ 3,097.58				
DES-153	10/01/18	DES-2351	TEG	\$ 6,885.45				
DES-154	10/01/18	DES-2351	TEG	\$ 721.23				
DES-155	10/01/18	DES-2351	TEG	\$ 489.57				
DES-156	10/01/18	DES-2351	TEG	\$ 678.80				
Interest/Transfer	09/04/18	-	-	\$ 230.69				
Interest/Transfer	09/04/18	-	-	\$ (230.69)				
CNE Sept R&I Invoice	11/01/18	DES-2353	CNE	\$ 8,675.15				
Sub-Total First Quarter				\$ 141,160.11	\$ 70,425.00	\$ -	\$ (70,735.11)	\$ (70,735.11)

Table 7B. FY19 Repair and Improvement Expenditure and Revenue Summary

Description	Date	Tracking #	Vendor	Expenditure	Transfers	Net Market Adjustment	Market Value	Balance
DES-144	10/29/18	DES-2351	TEG	\$ 1,879.53				
DES-151	10/29/18	DES-2351	TEG	\$ 169.70				
DES-155	10/29/18	DES-2351	TEG	\$ 776.27				
DES-156	10/29/18	DES-2351	TEG	\$ 691.42				
Interest/Transfer	10/02/18	-	-	\$ 262.18				
Interest/Transfer	10/02/18	-	-	\$ (262.18)				
DES-144	01/02/19	DES-2357	TEG	\$ 1,926.28				
DES-156	01/02/19	DES-2357	TEG	\$ 279.00				
CNE Oct R&I Invoice	12/01/18	DES-2355	CNE	\$ 7,736.95				
DES-144	12/01/18	DES-2355	CNE	\$ 40,000.00				
Interest/Transfer	11/01/18	-	-	\$ 296.02				
Interest/Transfer	11/01/18	-	-	\$ (296.02)				
CNE Nov R&I Invoice	01/24/19	DES-2357	CNE	\$ 8,253.54				
DES-151	01/02/19	DES-2357	TEG	\$ 546.90				
DES-155	01/02/19	DES-2357	TEG	\$ 2,534.59				
DES-156	01/02/19	DES-2357	TEG	\$ 1,095.76				
DES-156	01/24/19	DES-2357	CNE	\$ 4,929.00				
DES-155	01/24/19	DES-2357	CNE	\$ 15,281.00				
DES-144	01/24/19	DES-2357	CNE	\$ 20,556.00				
CNE Dec R&I Invoice	01/25/19	DES-2357	CNE	\$ 8,263.62				
Interest/Transfer	12/03/18	-	-	\$ 245.54				
Interest/Transfer	12/03/18	-	-	\$ (245.54)				
Sub-Total Second Quarter				\$ 114,919.56	\$ 70,425.00	\$ -	\$ (44,494.56)	\$ (44,494.56)
Interest/Transfer	01/02/19	-	-	\$ 235.04				
Interest/Transfer	01/02/19	-	-	\$ (235.04)				
CNE Jan R&I Invoice	03/01/19	DES-2361	CNE	\$ 3,808.28				
DES-144	03/02/19	DES-2361	TEG	\$ 5,488.55				
EMR 18-003	02/07/19	-	CNE	\$ 40,028.69				
Interest/Transfer	02/01/19	-	-	\$ 285.86				
Interest/Transfer	02/01/19	-	-	\$ (285.86)				
CNE Feb R&I Invoice	03/20/19	-	CNE	\$ 11,339.55				
DES-149	02/25/19	DES-2359	CNE	\$ 10,237.21				
Interest/Transfer	03/01/19	-	-	\$ 202.09				
Interest/Transfer	03/01/19	-	-	\$ (202.09)				
Sub-Total Third Quarter				\$ 70,902.28	\$ 70,425.00	\$ -	\$ (477.28)	\$ (477.28)
CNE March R&I Invoice	4/17/2018		CNE	\$ 9,359.58				
Sub-Total Fourth Quarter				\$ 9,359.58	\$ 23,475.00	\$ -	\$ 14,115.42	\$ 14,115.42
FY19 Year to Date				\$ 336,341.53	\$ 234,750.00	\$ -	\$ 2,693.86	\$ 2,693.86

B. Preventive Maintenance

Preventive maintenance, tunnel and manhole inspections and reviews of customers' mechanical rooms were performed during the quarter. The principle items for discussion are presented.

1. EDS Manhole Inspections

- a. The monthly vault and tunnel inspections were generally conducted as scheduled. However, with the amount of construction taking place within the downtown area, and with the NFL Draft preparation and activities, some manholes were not accessible.
- b. Customer metering station calibration checks were completed as scheduled.
- c. Water chemistry samples at customer buildings were taken as scheduled.

- d. Several of the vaults continue to require pumping due to the accumulation of either groundwater or surface water.
 - e. CNE continues to fabricate and replace trap assemblies within the EDS.
- 2. Other EDS Inspections
 - a. Other items are included in the CNE monthly reports.
- C. Emergencies

No emergencies were reported during the quarter.

D. EDS Walk-through

The EDS walkthrough was conducted in two segments. The first segment was conducted on April 23, 2019; and the second segment was conducted on April 24, 2019. The manholes and tunnel systems that were visited include Manhole 23, the State Tunnel, the AA Birch Tunnel, the 4th Avenue Tunnel, the 7th Avenue Tunnel and the Broadway Tunnel. The following comments and observations are a result of these visits (see the Action Item List at the end of this report).

1. State Tunnel

- a. There are several locations, where the concrete tunnel structure has some minor, moderate and major cracking, spalling, exposed rusty rebar and/or shifting of structures. Minor repairs are needed at the following locations: E11, E13, E17, E28, E30, E37, E44, E51, E52, E60, E61, E66, E67, E68, E69, N31, N45, N48, N50, N54, N56, N59, N61, W3, W4, W7, W11, W15, W17, W20, W42, W42, W48, W52 and W72. Moderate repairs are needed at the following locations: E26, E28, E29, N6, N7, W27, W43, W44 and W75. Major repairs are needed at the following locations: south of E1 and N20. Maintenance of the tunnel structure is the State's responsibility. The quantity and severity of these needed repairs have been conveyed to the State. The State hired a professional structural engineer to review the major repair areas and he agreed that the area south of E1 and the area of N20 should be avoided until repairs are made. Therefore, CNE personnel should avoid the area south of E1 and the area of N20 until repairs are made.
- b. There are several communications cables and inner ducts throughout the tunnel. Some of these cables/inner ducts have been placed on the piping supports; this could pose a problem for both piping maintenance and for the cabling. Discussions should take place with State personnel regarding the placement of this cabling. CNE personnel should be careful when they are reviewing the tunnel as these inner ducts and cabling could be a trip hazard.
- c. There is a condensate leak near Station W75. This leak should be located and repaired. Requires action as soon as possible.

- d. The grout underneath the base plate of the piping support column at Station N33 needs to be repaired. Requires action within the next quarter.
 - e. Several of the pipe support C channels and W shapes have minor to moderate corrosion. These locations include E1, E2, E3, E4, E7, E8, E9, E12, E13, E26, E28, E29, E37, E44, E60, E64, E65, E66, E69, W2, W3, W4, W5, W6, W7, W8, W9, W11, W27, W55, W56, W62, W64, W73, W74, W75, N8, N9, N10, N11, N12, N13, N14, N15, N19, N20, N21, N22, N23, N28, N29, N30, N31, N32, N38, N39, N40, N41, N42, N45, N46, N47, N49, N50, N51, N52, N54, N55, N56, N57, N58, N59, N60, N61, N62, N63 and N64. These members support DES piping and are not considered part of the structure and need to be cleaned and painted.
 - f. The steam service valve located at E17 has a packing leak. CNE should evaluate and either tighten or replace the packing as soon as possible.
2. AA Birch Tunnel
- a. There was a flange leak on the steam isolation valve in upper level of Manhole D3. CNE has repaired this leak however the insulation has not been repaired. CNE should have this insulation repaired as soon as possible.
 - b. The insulation was removed from a section of the chilled water piping at Station 1+25 to repair a pinhole leak. Due to CJC construction site blasting activity, the replacement of this insulation was delayed. Now that the blasting is complete and with the cooling season approaching, CNE should have this insulation replaced with insulation to match the existing.
 - c. Groundwater is leaking into Manhole D2 at the west end of the tunnel at the western chilled water piping penetration. CNE should tighten the link seal at this location to attempt to reduce or eliminate this leak.
 - d. There are some hairline cracks radiating from the chilled water piping penetrations in Manhole D2. CNE should monitor these cracks and report any significant changes to TEG.
 - e. The grating and some of the structural members supporting the grating in Manhole D2 has experienced some moderate corrosion. The grating in these areas should be replaced with galvanized grating. The structural members should also be cleaned and painted during this replacement.
 - f. There is minor to moderate corrosion on the piping supports at Stations 0+08, 0+47, 0+65, 0+85, 1+05, 1+45, 1+65, 2+03, 2+20 and 3+20. CNE should wire brush/wire-wheel these areas and paint it with cold galvanizing paint to prevent further corrosion.
 - g. There is debris around the sump pumps. This area/debris should be cleaned within the next quarter.
 - h. The Manhole D3 entry ladder has some minor corrosion where ladder sections join. CNE should clean/remove this corrosion and then paint the area with cold galvanizing paint.
 - i. The chilled water piping vents in Manhole D3 need to be re-insulated; the existing insulation is not sufficient to prevent condensation.

- j. The light at Station 2+79 is not working; CNE should repair this light as soon as possible.
 - k. The condensate return piping in Manhole D3, Manhole D3's vertical shaft and the eastern end of the tunnel was shaking and vibrating during a portion of the site visit. It is believed that this might occur when the AA Birch Building's condensate return pumps engage. CNE should investigate this shaking to determine the cause and update TEG on their findings. This investigation needs to happen as soon as possible.
3. 4th Avenue Tunnel
- a. The steam expansion joints at Stations 4-45, 4-62 and 4-78 are leaking. CNE should first tighten the packing injection location bolts in an attempt to stop the leak. If this is not successful in stopping the leak, CNE should make repairs once the leak is large enough that injection repairs will be successful.
 - b. The pipe supports at Stations 4-11, 4-12, 4-14,4-17, 4-38, 4-45, 4-79, 4-80, 4-81, 4-82, 4-83, 4-84, 4-85, 4-86, 4-87, 4-88, 4-90 and 4-95 have minor to moderate corrosion and need to be cleaned and painted. TEG will develop a scope of work and coordinate with CNE to have this work accomplished.
 - c. The pipe stanchions for the service piping at 4-52 have moderate to severe corrosion and need to be cleaned and painted. TEG will develop a scope of work and coordinate with CNE to have this work accomplished.
 - d. The piping support Teflon slides at locations 4-2, 4-3, 4-4, 4-5, 4-10, 4-26, 4-27, 4-28, 4-29, 4-30, 4-32, 4-35, 4-39, 4-40, 4-42, 4-45, 4-49, 4-56, 4-57, 4-68, 4-69, 4-72, 4-74, 4-77, 4-84, 4-89, 4-91 and 4-94 are in need of repair. TEG will develop a scope of work and coordinate with CNE to have this work accomplished.
 - e. The branch steam piping in the vertical shaft at the old Suntrust Building (4-62) has a blind flange connection at the top of the vertical piping. The gasket at this blind flange connection was recently replaced due to a leak, but the insulation has not been repaired. CNE needs to have the insulation repaired and order an insulation blanket for the flange connection. The insulation repair should match the existing material and thickness.
 - f. Some minor insulation repairs are needed at 4-94. CNE should make note of this need and when additional insulation repairs are needed within the 4th Avenue Tunnel, this location should be included.
 - g. The emergency light at 4-45 is not working. CNE should investigate and repair this light as soon as possible.
4. 7th Avenue Tunnel
- a. The trap isolation valve packing at Station 7-81 is leaking. This packing should be tightened to stop this leak. If tightening the packing does not stop the leak, a shut-down would be required to replace this valve. CNE should investigate this leak and determine the action required to fix it as soon as

possible. If a shutdown is required, CNE should coordinate and schedule a shut-down to make this repair.

- b. The pipe support stanchions at location 7-81 were recently cleaned and painted. However, the stanchion baseplates were buried under dirt and silt and had to be “dug out” to permit the cleaning and painting. Groundwater now accumulates in this dug out area. A small trench needs to be dug from this low point, southward to allow this water to drain down the tunnel. CNE should dig this trench as soon as possible.
- c. The pipe supports at Stations 7-23, 7-33, 7-42, 7-45, 7-46, 7-52, 7-53, 7-57, 7-59, 7-63, 7-77 and 7-80 have minor to moderate corrosion corroded need to be cleaned and painted.
- d. The steam and condensate anchor table at location 7-42 has moderate to severe corrosion. This location experiences a lot of groundwater intrusion. Due to physical constraints, it does not appear that cleaning and painting the structure will be effective, therefore a new structure needs to be designed and installed adjacent to the existing structure. TEG will develop a design and scope to replace this anchor table.
- e. The pipe stanchion supports at Stations 7-11 (Hume Fogg service) and 7-45 (Library) are have moderate to severe corrosion and should be replaced or cleaned and painted to prevent further corrosion. TEG will develop a design and scope to address these supports.
- f. The piping support Teflon slides at locations 7-3, 7-5, 7-6, 7-9, 7-11, 7-12, 7-14, 7-15, 7-18, 7-20, 7-28, 7-29, 7-32, 7-37, 7-41, 7-44, 7-45, 7-46, 7-55, 7-65 and 7-68 are in need of repair. TEG will develop a scope of work and coordinate with CNE to have this work accomplished.
- g. One of the light support brackets at Station 7-42 is broken and the electrical conduit is corroded. CNE needs to repair/replace the light support and conduit in this area as soon as possible.
- h. The steam expansion joint at Station 7-61 is leaking. CNE should tighten the packing bolts to see if this stops the leak. If this is not successful in stopping the leak, CNE should make repairs once the leak is large enough that injection repairs will be successful.
- i. The emergency light at Station 7-32 is not working. CNE needs to repair this light as soon as possible.
- j. Groundwater infiltration continues at Station 7-44. TEG had wicking material draped over the piping at this location in an attempt to mitigate any damage which may occur to the piping or piping supports. CNE should continue to monitor this infiltration and let TEG know if significant changes occur.

5. **Broadway Tunnel**

- a. The steam expansion joints at Stations B-96, B-83, B-65 and B-19/20 are leaking. CNE should tighten the packing bolts to see if this stops the leak. If this is not successful in stopping the leak, CNE should make repairs once

the leak is large enough that injection repairs will be successful. The leak at Station B-65 is fairly severe.

- b. Original Nashville Convention Center service: There is some minor corrosion on the pipe hanger lugs at the top of the vertical service shaft in Manhole 19. CNE should clean these lugs with wire brushes/wire wheels and paint them with cold galvanizing paint to prevent further corrosion.
- c. There is some insulation damage at Station B-82, B-80, B-50 and B-49 that is the result of the contraction of the piping from a shut down. CNE should make repairs to these areas using Pyrogel insulation so that there is not any interference with the piping supports. These repairs should be coordinated with other insulation repairs in the 4th, 7th and AA Birch Tunnels.
- d. The steam expansion joint at the southern end of the Bridgestone service tunnel is leaking; the maintenance of this expansion joint is the City's responsibility. CNE needs to tighten the packing injection bolts to try and stop this leak. If this is unsuccessful, since this line can be isolated fairly easily, the next step is to obtain the make and model number of the joint and order packing material. Once received, arrange an agreeable time with Bridgestone to isolate the service piping, remove the packing bolts and inject additional packing. If this is not successful in stopping the leak, CNE should make repairs once the leak is large enough that injection repairs will be successful.
- e. There is trash and debris in the Bridgestone service tunnel.
- f. The traps at Stations B-65 and B-50 are hammering. Based on the sound, both these traps seem to be leaking through. CNE needs to diagnose this problem and if needed, replace these traps. TEG will investigate the possible addition of a sparge tubes at this location.
- g. The trap piping at Station B-20 should be insulated for personnel protection.
- h. There is some minor to severe corrosion on the piping supports in Manhole 18 (at the east end of the tunnel), B-17, B-32, B-65, B-66 and B-68. TEG will develop a scope of work and coordinate with CNE to have this work accomplished.
- i. The piping support Teflon slides at locations B-6, B-8, B-10, B-13, B-14, B-16, B-17, B-19, B-20, B-21, B-22, B-26, B-31, B-33, B-34, B-35, B-37, B-41, B-43, B-46, B-53, B-57, B-60, B-62, B-63, B-65, B-68, B-69, B-72, B-74, B-75, B-77, B-78, B-80, B-81, B-85, B-86, B-88, B-89, B-93, B-94 and B-96 are in need of repair. TEG will develop a scope of work and coordinate with CNE to have this work accomplished.
- j. The condensate piping support at Station B-38 has failed. It consists of an "upside down" tee placed underneath and welded to the underside of the piping that rests on a horizontal square tube. Either side of the tee's flange is "cradled" by small angles that guide the movement of the piping. The tee has buckled and its webbing is now in a horizontal position. TEG will do some additional investigation, and develop a scope of repair to make this repair.

- k. The emergency light at Station B-66 is not working. CNE should repair this light as soon as possible.
 - l. The chilled water drain piping at Station B-62 is uninsulated. This piping should be insulated to prevent sweating and potentially prevent freezing of this piping in the winter months.
 - m. The electrical receptacle at Station B-29 is damaged and requires repair. CNE should make this repair as soon as possible.
 - n. There is a lot of debris in Manhole 18 that needs to be cleaned or removed. CNE should have this debris removed no later than July 1, 2019.
 - o. In February 2019 it was discovered that the steam and condensate piping anchor immediately west of Manhole 18 (located at the east end of the Broadway Tunnel) had partially failed and moved to the east. TEG instructed CNE to make emergency repairs in order to brace the steam piping to prevent it from moving any more. This work was completed in March 2019. However, in its current position, the steam and condensate piping may come off of its piping supports if the systems are shut down and the piping allowed to cool to ambient conditions. Therefore, the steam and condensate piping needs to be re-positioned and re-anchored to prevent this occurrence; this will require a temporary shut-down of the steam system. TEG is currently developing a design and scope for this additional work to take place this summer during low steam loads.
6. Manhole 23
- a. A repair project was just completed in this manhole which included concrete repairs, structural steel support repairs, media blasting and painting of the structural supports, installation of a new access ladder and the installation of new insulation blankets. Therefore, this manhole is now in good repair.
 - b. The strainer upstream of one of the traps does not have a blowdown valve; a blowdown valve needs to be added to this strainer.
 - c. There is a flanged steam valve in this manhole that is blind flanged. The pipe flange connection is leaking. This flange has a clamp on it with injection nozzles presumably because of prior leaks. CNE should make repairs once the leak is large enough that injection repairs will be successful.

Action Items

Action items from the above walk through are presented in the separate quarterly manhole review report presented to CNE.

VI. Customer Relations

This section contains descriptions of the marketing efforts made by the DES Team during the quarter. The topics of interactions, meetings and training seminars with the customers are also discussed. There are currently 28 customers, comprised of 40 different buildings, connected to

the EDS. Service to each of these buildings continues to prove satisfactory, and the responsiveness to customer issues is handled by CNE in an excellent and professional manner.

A. Marketing

Negotiations on the CSA with CB Ragland are ongoing. At this time, they have verbally agreed on chilled water service to their proposed 253 room hotel to be constructed along Molloy Street between 2nd and 3rd Avenues South. This project is tracked under project number DES-162.

The initial conversations with the developers of Lot K (immediately adjacent to the east of the EGF) began during the quarter.

B. Customer Interaction

The CNE customer service representative (CSR) continues to respond to customer issues as they arise. Much of the communication involves minor problems with the customers' heating and cooling systems that are unrelated to DES service. Other more significant issues are summarized herein.

- In January, CNE's CSR met with the new managers and building personnel at the CitySpace Office Tower (formerly the Renaissance Office Tower).
- The contractor renovating the John Sevier Building unknowingly removed and discarded the DES chilled water flow meter but has since purchased a new one for the DES (per the DES specifications) which will later be re-installed in the building upon completion of the renovations.
- Additional repairs to the steam meter at the Bobby Hotel were needed during the quarter. This meter was repaired, however, and is working properly at the time of this report.
- A steam leak was discovered at the Municipal Auditorium near the DES isolation valve to the building and was repaired.
- The Hyatt Place Hotel isolated their chilled water system in March and cleaned their plate and frame heat exchanger.
- Partial isolations of the chilled water distribution system were made during March in the area of 5th Ave N and Union St to determine if there were any chilled water leaks in the area.
- Other minor issues and customer interactions are noted in the monthly reports from CNE.

VII. Recommendations

Based on the review of the Third Quarter FY19 EGF and EDS operations, the following recommendations are made.

- The items noted in the Walkthrough Reports as in need of repair need to be completed prior to the end of the operating contract for the System Operator in accordance with the ARMA paragraph 12.03.
- CNE needs to address the issues related to the cooling towers at the EGF and improve the overall chiller plant efficiency.
- Corroded structural steel within the vaults and tunnels should be cleaned and painted or replaced.
- Insulation which is absent, or in disrepair, in the vaults should be addressed through additional capital and R&I projects, and through regular maintenance provided by CNE.
- Steam traps which need repair or replacement should be addressed as soon as possible.
- Expansion joint leaks should be repaired by either tightening the packing bolts or injection of packing once the leak(s) is substantial enough to warrant repair.
- Debris needs to be cleaned and removed from some tunnels.